2014-09-09 day 10

2.2 #5

$$\lim_{y\to 2^-} \frac{(y-1)(y-2)}{(y+1)}$$

$$= \frac{(2-1)(2-2)}{(2+1)} = \frac{1(0)}{3} = 0$$

recall $\lim_{x\to a} \frac{P(x)}{Q(x)} = \frac{P(a)}{Q(a)}$ as long as bottom isn't zero

Moral: for most things (* see 2.5) we are going to try substitution first.

$$\lim_{y\to 2^-} \frac{(y-1)(y-2)}{(y+1)(y-2)}$$

indeterminate form of $\frac{0}{0}$ [same strategy for $\frac{\infty}{\infty}$]

strategy 1 [for $\frac{0}{0}$]: "cancel out zeros"

$$= \lim_{y\to 2^-} \frac{y-1}{y+1} = \boxed{\frac{1}{3}}$$

y: 5

$\frac{+}{+(-)}$

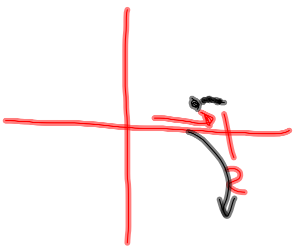
1.9

$\frac{+}{+(-)}$

$$\lim_{y\to 2^-} \frac{(y-1)}{(y+1)(y-2)} \overset{\text{subs}}{=} \frac{1}{3(0\text{ish})} \text{ (no good)}$$

but I know only 3 possible answers

$+\infty$ $-\infty$ DNE



y-1 approach 1 } no worries

y+1 approach 3 } no worries

y-2 approach 0* from the negative direction

$\therefore \lim_{x\to 2^-} f(x) = -\infty$

"therefore"

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2.2 6) $\lim_{x\to 3} \frac{x^2-2x}{x+1} = \frac{9-6}{4} = \boxed{\frac{3}{4}}$

$x(x-2)$

$\lim_{x\to 3^+} \frac{(x^2-2x)}{(x+1)(x-3)}$

1) substitution $\rightarrow \frac{3}{0\text{ish}}$ no good

2) Know: $+\infty, -\infty$, DNE

3) but which?

as x "approaches" 3 From the positive side

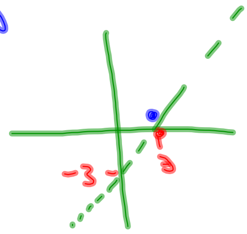
x^2-2x approaches 3

$x+1$ approaches 4

$x-3$ approaches 0 (but from positive side)

$\frac{+}{+(+)}$ positive

$\lim_{x\to 3^+} \frac{x^2-2x}{(x+1)(x-3)} = +\infty$



$\lim_{x\to 3^-} \frac{(x^2-2x)}{(x+1)(x-3)} \rightarrow -\infty$

x-3 goes to 0 from negative directi

$\lim_{x\to 3} \frac{x^2-2x}{(x+1)(x-3)}$

=DNE

$\lim_{x\to 3^+} \frac{(x^2-2x)}{(x+1)\,(3-x)}$ $-\infty$

$x \mapsto 3^+$

$3-x$ approaches 0 from the negative side

$-(3-x) = x-3$

$-(x^2-17) = 17-x^2$

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$$f(x) = \begin{cases} \frac{1}{x+2} & ; x < -2 \\ x^2 - 5 & ; x \in (-2, 3] \\ \sqrt{x+13} & ; x > 3 \end{cases}$$

piecewise-defined

$\in$ "is an element of"

$\lim_{x \to -2^+} f(x) = -1$

$\frac{1}{x+2} \to +\infty$, $-\infty$ DNE

$\lim_{x \to -2^-} \cancel{f(x)} \frac{1}{x+2} = -\infty$

$\frac{1}{x+2}$ approaches $\frac{1}{0}$ (+) from the neg side (−)

$\lim_{x \to -2} f(x) = \boxed{\text{DNE}}$

Left

$\lim_{x \to 3^+} f(x) = 4$

$\lim_{x \to 3^-} f(x) = 4$

$\lim_{x \to 3} f(x) = 4$

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$\cancel{\sqrt{x^2} = \sqrt{16}}$

$\sqrt{16} = 4$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$\sqrt{25} = 5$

$x^2 = 16$

one answer is $+\sqrt{16}$, the other is $-\sqrt{16}$

we define $\sqrt{x}$ to be a function

so then $\sqrt{16}$ has only 1 value.